WEST Search History

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DATE: Sunday, April 18, 2004

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☐	L5	arrival time near3 packet near5 (detect$ or determin$)	76
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☐	L1	(packet arrival time or pat) near3 (detect$ or determin$)	343

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L6: Entry 2 of 3 File: USPT Sep 21, 1993

DOCUMENT-IDENTIFIER: US 5247464 A
**** See image for Certificate of Correction ****
TITLE: Node location by differential time measurements

Abstract Text (1):
A system for determining the physical location of nodes on a network. The system includes two stations each of which has a clock. Each station uses its clock to determine the arrival times at the station of a packet transmitted over the network from a first node to a second node and of a reply packet sent by the second node to the first node. The arrival times of the packets and the corresponding reply packets are then used to calculate the distance along the network which separates the first and second node. Measurement of packet arrival times for all of the nodes yields the position of all of the nodes on the network.

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L7: Entry 1 of 1 File: USPT Oct 23, 2001

DOCUMENT-IDENTIFIER: US 6305233 B1
**** See image for Certificate of Correction ****
TITLE: Digital speed determination in ultrasonic flow measurements

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Search Results - Record(s) 1 through 1 of 1 returned.

☐ 1. Document ID: US 6305233 B1

L9: Entry 1 of 1 File: USPT Oct 23, 2001

DOCUMENT-IDENTIFIER: US 6305233 B1

**** See image for Certificate of Correction ****

TITLE: Digital speed determination in ultrasonic flow measurements

Abstract Text (1):

A method and device (60) is described which measures the speed of a flowing fluid (F) by measuring the difference in time taken for an ultrasonic signal to travel first upstream and then downstream in the fluid. In each direction the device (60) calculates the time taken for an ultrasonic wave packet emitted by one ultrasonic transducer (62) to be received by another (63). The method used consists of the digitisation (85) of the received waveform and the subsequent identification of waveform features by comparison with a standard template of the waveform. The position in time of these features is then determined with respect to a high speed clock (70). The results are then used in a weighted computation to determine the time of arrival of the waveform at the transducer (63).

Detailed Description Text (40):

As mentioned above, the microprocessor 65 includes a .mu.ADC 103 which is formed from a comparator 104, which receives the analog input, a successive approximation register 105, and a digital-to-analog converter (DAC) 106, a configuration well known in the art. A bidirectional buffer 107 permits coupling of converted data onto internal buses 108 of the microprocessor 65.

Detailed Description Text (46):

The comparator 104 compares the output of the DAC 106 with the voltage from the sensor 101. This determines the N value for which V.sub.dac =V.sub.in.

Detailed Description Text (58):

With a digitized representation of the received signal in the static memory 77, the microprocessor 65 and its associated software can then extract an estimate of the time of arrival of the acoustic signal. This is done by resetting the address counter 76, and switching its input from the 10 MHz clock to an output line of the microprocessor 65. A starting address is loaded into the address counter 76 and, by toggling the aforementioned microprocessor output line, the software can access subsequent bytes of the static memory 77 in sequence. The starting address is also loaded into a memory location in the microprocessor 65, and this "shadow" address value is incremented every time a data value is fetched from the static memory 77. To establish a quiescent signal level 45 (see FIG. 3), which precedes the arrival of the acoustic wave packet and which acts as a reference against which all other measurements are compared, a number of bytes, typically a power of 2 such as 128 or 256, are read from the static memory 77, summed and then averaged. The starting point for the address counter 76 must be low enough to allow for this determination

of the quiescent signal level 45 from data received prior to the earliest anticipated arrival of the acoustic signal. The quiescent signal level 45 is thus representative of a no-received-signal (NRS) state of the measurement system 60. Also, the earliest anticipated arrival of the acoustic signal represents the commencement of a measurement portion of the stored digital signal data which is representative of an analogue signal output from the transducer indicating a response of the transducer to the acoustic wave packet. The measurement portion can extend for about 10 to 20 cycles of the received signal 40.

Detailed Description Text (60):
As each byte is read from static memory 77, and prior to being placed in the circular buffer, it is compared with the quiescent signal level 45 previously obtained, and the sign of the difference is compared with the value obtained from the previous byte. If the sign is the same as that calculated from the previous byte, the received signal has not crossed the quiescent signal level 45 and the current sign is stored for a future comparison. If the current sign differs from the previous sign, the received signal has crossed the quiescent signal level 45 and a limit is set that is equivalent to the current value of the aforementioned "shadow" address value, plus half the circular buffer size. Bytes are then read from the static memory 77 and put into the circular buffer until the shadow address value reaches the abovementioned limit, at which time the circular buffer contains a set of data points approximately equally disposed about the quiescent signal level 45. This represents a measurement segment individually manipulable for timing calculations.

Detailed Description Text (65):
The intercepts determined from the linear regression at Point (9) thus serve as the timing markers if their absolute position can be determined within the waveform as a whole. To do this, the successive slope values within the FIFO buffer are compared with a stored set of slopes, referred to herein as a "template" and indicated at Point (13). This stored template is representative of the early part of the waveform, the shape of which may vary depending on the fluid flow rate, the properties of the fluid, and the temperature. A convenient size for this template is two to four elements, either of successive slope magnitudes of alternating sign, or alternate slope magnitudes of the same sign. Once the FIFO buffer of slopes has been filled, as each new slope value (including magnitude and sign) is inserted, selected elements are compared at Point (14) with the template to obtain a sum-of-squares of differences. This measure passes through a minimum when the template best matches the selected elements of the FIFO slopes buffer, and the process stops the matching process when the newly calculated sum-of-squares exceeds the previous value. At this stage, the intercepts have been correctly located within the waveform as a whole, based on the known template, with each intercept being nominally an integral number of half-periods from the start of the received signal. Thus, the matching of the slopes identifies a specific location or determines a measurement position for each slope within the received analog signal waveform, which is related to the commencement of the acoustic wave packet.

Detailed Description Text (83):
The method also makes it possible to take account of the ageing of the transducers, or other processes that may change the shape of the waveform, by slowly updating the template against which the waveform is compared. This is possible because there is a large degree of difference permitted while still obtaining a correct determination of the absolute position in the waveform.

Detailed Description Text (99):
The delay counter 123 and the timing counter 125 are started when the first ultrasonic burst is sent. The leading edge of this first ultrasonic burst is synchronized to the timing clock 70. The start of the second and subsequent ultrasonic bursts is asynchronously triggered by the arrival at the detector end of the measuring tube 61 of a specific crossing belonging to the preceding ultrasonic

burst. The specific crossing which triggers the retransmit command is the first crossing of the quiescent signal level 45 of the required polarity (positive- or negative-going) to arrive after the delay counter 123 has timed out. The polarity required for a crossing to generate a retransmit depends on the polarity of the preceding transmit. A comparator 126 is provided to detect these crossings and includes inputs connected to the signal reference 86 and the bandpass filter 84. An output of the comparator 126 connects to the transmit controller 121 to trigger a re-transmit command.

Detailed Description Text (103):
A ringaround sequence consists of, typically, 64 acoustic transmissions in each direction, all but the first being triggered by reception of the preceding transmission. To assist in cancel the buildup of coherent acoustic noise in the measurement tube as the ringaround sequence proceeds, the polarity of the transmitted signal is reversed on a regular basis throughout the sequence. The sequence is notionally made up of groups of four transmissions, with the polarity of every fourth transmission reversed with respect to the other three. Thus, if the two possible polarities are designated "A" and "B", a sequence of 64 transmissions could have a polarity pattern of "AAABAAABAAAB . . . ", the "AAAB" pattern being repeated 16 times overall. The polarity of the crossing comparator 126 on the received signal is reversed just after a "B" polarity transmission and changed back again just after the first following "A" polarity transmission to ensure that it matches the received signal polarity. Further, to cancel errors which might be introduced due to offset on the comparator 126, the overall polarity of the ringaround sequence is reversed for each complete gas velocity measurement. Thus the polarity sequence above becomes "BBBABBBABBBA . . . ", again with the appropriate reversals of the polarity of the crossing comparator 126 on every fourth transmission.

Detailed Description Text (118):
It will thus be apparent from the foregoing embodiments that the general method relies on the conversion of the analogue wave packet signal to digital information, and the subsequent use of this digital information, by comparison with a standard digital template of selected waveform features, both to uniquely identify a number of particular cycles of the waveform and to combine this information to give an elapsed time measurement of significantly reduced uncertainty for the arrival of the received wave packet.

Detailed Description Text (126):
The preferred method also makes major use of a quantification of the slope of the waveform as it makes a transition from a negative to a positive peak or vice versa. An array of slopes is used to describe the waveform in a simple and concise way. This also gives the user the ability to compare waveforms with a minimum of data. The transition slope also confers the ability to identify the position of the transition within the waveform and thus calculate the position of the beginning of the waveform. Each transition slope can also be used to infer the amplitude of the accompanying peak and can be used as an alternative parameter to the peak height, and thus the transition slope provides a useful parameter for the adjustment of gain in the system.

Detailed Description Text (128):
The preferred method also confers the ability to accommodate any changes in the ultrasonic signal which might accompany the ageing of, or any damage to, a transducer assembly, by slowly updating the template against which the waveform is compared. This is possible because the method permits a large degree of difference in the size and shape of the waveform while still obtaining a correct determination of the absolute position of the timing marker within it.

CLAIMS:

35. A method as claimed in claim 34, wherein step (d) includes comparing the plurality of slopes with a set of reference slopes, identifying from the comparison with the set of reference slopes a specific location in said analogue signal, and determining from the specific location in said analogue signal, using the average waveform period, the arrival time.

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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